

STORMS AND WEATHER WARNINGS

WASHINGTON FORECAST DISTRICT

There were three storms of considerable intensity during the month. The first developed suddenly over Virginia and the Carolinas during the night of the 2d-3d, and by 8 a. m. of the 3d the barometer had fallen to 29.58 inches at Cape Hatteras. Southeast storm warnings were ordered displayed at 10 a. m. from New York City to Eastport, Me., and northwest storm warnings at 9 p. m. south of New York to Hatteras. By 8 a. m. of the 4th the pressure near the center of the storm had fallen to 29.08 inches at New Haven, Conn. Gales were experienced at all points from Hatteras northward, New York City reporting a maximum of 56 miles per hour from the northwest and Portland, Me., 52 miles per hour from the southeast.

Just two weeks after the first storm another was central near Wytheville, Va., moving northeastward with increasing intensity. At 9:30 a. m. southwest storm warnings were displayed from Cape Hatteras to Eastport, Me. This storm was also attended by shifting gales along the entire Atlantic seaboard north of Hatteras and by a small tornado in the vicinity of Washington, D. C. (See p. 499 of this REVIEW.) At New York City and Sandy Hook, N. J., the wind attained a velocity of 60 miles per hour from the south.

The only other storm of importance was that of November 30-December 1. A secondary disturbance of moderate intensity, that was central over southeastern Missouri the morning of the 30th, moved northeastward with great rapidity as well as with rapidly increasing intensity. By 8 p. m. the center was over northeastern New York, Northfield, Vt., reporting a barometer reading of 29.42 inches. New York City reported the highest wind velocity, 64 miles per hour from the northwest, but velocities in excess of 50 miles per hour occurred at Cape Henry, Atlantic City, Sandy Hook, Block Island, and Nantucket.

Because of the unusually mild weather during October, frost warnings were still required at the beginning of November throughout the district. Warnings for limited areas were issued on the 2d, 3d, 4th, and 5th, and general warnings for all sections, except the Florida Peninsula, on the 6th. By the 7th killing frost or freezing temperature had occurred quite generally as far south as Tennessee and the interior of North Carolina. On the 12th, 16th, 17th, 18th, 19th, and 20th warnings were issued for portions of the South Atlantic and east Gulf States, the heaviest frosts over a considerable area occurring on the 19th and 20th. No cold-wave warnings were issued during November, except for the extreme western portions of Kentucky and Tennessee and northwestern Ohio on the 30th.—*C. L. Mitchell.*

CHICAGO FORECAST DISTRICT

The storms moved across the forecast district with more than the usual frequency, and in consequence a larger number of storm and small-craft warnings than usual were ordered for the Great Lakes.

Small-craft warnings took care of the vessel interests until the close of the first decade, as up to that time winds on the lakes were not dangerous for large vessels. However, a storm which developed in the Far West had by the 11th reached the upper Mississippi Valley and passed across the Great Lakes on the 11th and 12th with steadily increasing energy and was followed by a cold wave of

moderate proportions. Storm warnings were displayed at all stations on the Great Lakes for this storm, and cold-wave warnings were ordered on the morning of the 11th for the entire forecast district, the falls in temperature being from exceptionally high maxima for the season to something close to or below the seasonal normal.

Another storm immediately followed in the West, and on the 15th it passed over the Great Lakes. In this storm the strong winds were mainly confined to the upper Lakes region, where storm warnings were displayed, and small-craft warnings appeared to be sufficient for the lower Lakes as the storm in its movement eastward lost energy. However, by the 17th there was a redevelopment of a secondary disturbance in the South, and as it passed northeastward across the Appalachians with constantly increasing barometric gradient to the north over the lower Lakes, storm warnings in that area appeared to be justified, and these were ordered on the morning of the 17th from Cleveland eastward.

Following this storm small-craft warnings served all purposes on the Great Lakes until the closing days of month, when warnings were ordered on all lakes as a storm of considerable energy passed eastward from the Northwest accompanied by high winds and squalls and followed by another sharp fall in temperature.

Because of the unusual warmth in the Middle States during the month, thundersqualls appeared to be much more frequent than usual, and in Chicago a record of seven thunderstorms for the month of November was established.

Advices during the month were issued to various interests which call for special service. Forecasts for considerable periods in advance, for a week or more, are being made upon request, and these appear to be quite satisfactory on the whole.—*H. J. Cox.*

NEW ORLEANS FORECAST DISTRICT

Moderate cold waves, for which ample and timely warnings were issued, overspread most northern and central sections on the 11th-12th, 14th-15th, and on November 30-December 1. These cold waves lost strength as they moved southeastward and the cold wave warnings issued on the 11th, 29th, and 30th were not fully verified in some northeastern and central localities, but pronounced temperature changes occurred, with minimum temperatures near the verifying limits.

Frost or freezing warnings were issued for northern or central areas on the 2d, 3d, 5th, 12th, 14th, and 15th, and for southern or southeastern areas on the 16th, 17th, 18th, and 30th. Conditions occurred as forecast, except where cloudy weather prevailed in a few instances.

No storm warnings were issued or required, but small-craft warnings displayed on the Texas coast on the 16th and 30th and on the Louisiana coast on the 16th for fresh to strong northerly winds were justified.

A "norther" warning for shipping interests at Tampico, Mexico, was issued on the 16th and winds occurred as forecast.

A "fire-weather" warning for forested areas in Oklahoma was issued on the morning of the 25th, giving advance notice of strong winds, with fair weather, that occurred in the ensuing 24 to 36 hours.—*R. A. Dyke.*

DENVER FORECAST DISTRICT

A rapid succession of LOWS moved from the north Pacific coast southeastward across the Rocky Mountain region during practically the entire month, while high

pressures persisted most of the time in western Canada east of the Continental Divide and on the extreme northeastern Rocky Mountain slope.

Warnings of moderate cold waves were issued as follows: North-central Arizona on the morning of the 1st, northeastern Colorado and southern Wyoming on the evening of the 10th, southeastern Colorado on the morning of the 14th, Wyoming and northeastern Colorado on the morning of the 20th, east of the Divide in southern Montana and Wyoming on the evening of the 20th, eastern Colorado on the morning of the 21st, eastern Colorado and southeastern Wyoming on the evening of the 21st, southeastern Colorado on the morning of the 22d, east of the divide in Montana on the morning of the 26th, and southwestern Utah on the morning of the 29th. Warning of a severe cold wave was issued on the evening of the 19th for that portion of Montana immediately east of the divide and on the morning of the 21st for Wyoming. As a rule, the warnings were verified.

Cold waves without warnings occurred in eastern Montana and northern Wyoming on the 10th-11th, in north-central Arizona on the 23d, in northeastern Montana on the 29th, and in southeastern Wyoming and portions of central and northeastern Colorado on the 30th.

As snow and strong northerly winds were indicated in southern Wyoming at the time of the evening forecast of the 10th, and rains, turning to snow, with fresh to strong westerly winds, becoming northerly, when the morning forecasts of the 20th were made, livestock warnings were included in the cold-wave warnings for that State. The warnings were justified.

For the benefit of aviation and livestock interests, warnings of strong winds were also issued for Wyoming and eastern Colorado or portions of this region on the 2d, 6th, 7th, 8th, 9th, 10th, 19th, 20th, 21st, 24th, and 25th, for Montana and Wyoming on the 25th, and for Montana, Wyoming, and northeastern Colorado on the 27th and 28th. These forecasts were generally verified.

Frost warnings were issued for south-central and southeastern Arizona on the 1st, 22d, 23d, and 30th. The warnings of the 22d and 30th were verified, but those of the 1st and 23d failed of verification, due to the failure of HIGHS which were then over the plateau to advance southward.—*J. M. Sherier.*

SAN FRANCISCO FORECAST DISTRICT

The weather charts of the month showed that seven well-defined depressions crossed the coast line and passed into the interior and affected the weather over a part or the whole of this forecast district. Four of these depressions crossed the coast line north of Cape Flattery and three, those of the 6th, 9th and 12th, in their eastward movement crossed the coast line south of Cape Flattery and caused general rains over the southern parts of this forecast district.

The month was a stormy one over the northeast Pacific Ocean and as disturbances were detected over the ocean the issue of storm warnings became necessary, this occurring on a number of occasions, namely, for a part or the whole of the coast line, on the 1st, 8th, 11th, 12th, 15th, 18th, 22d, 26th, and 29th. The storm following the warning of the 18th was the severest of the month along the coast of Washington and Oregon, the wind reaching a velocity of 72 miles an hour at North Head and 82 miles an hour at Tatoosh Island during the night of the 18th. The storm of the 23d following the warning issued on the 22d was also severe, and, like that of the night of

the 18th, caused distress to a number of vessels off the north coast. The other storms during the month were of only moderate severity, but in all instances the attending winds justified the issue of the storm warnings. The warning issued on the 22d was a warning for a whole gale and was equivalent to a hurricane warning.

Frost warnings were issued for northern California on the 22d, 23d, and 24th of the month, and for the northern parts of the forecast district as occasion demanded.—*E. H. Bowie.*

RIVERS AND FLOODS

By H. C. FRANKENFIELD

Aside from the disastrous New England flood, which is discussed in full elsewhere in this REVIEW, there were no rises of importance during November. Such others as did occur were without damage, except as noted below for the Allegheny and Willamette Rivers. The rise in the Illinois, which continued into December, will be reported upon in the REVIEW for that month.

Allegheny River.—Over the drainage area of this stream the precipitation for the month was large, and moderate floods occurred on November 18 and again on November 27 and 28. At Lock No. 5, Freeport, Pa., water from the first rise cut into the left bank just below the dam and damaged the bank and adjacent property. The highway was undermined and washed away; also three houses on the opposite side of the highway. The damage amounted to about \$15,000. Crest stages at Pittsburgh, Pa., were 21.4 feet at 10 a. m. November 19 and 23.1 feet at 8 a. m. November 29.

Willamette River.—Heavy rain on November 24 over the lower portion of the drainage area, where, owing to a previous excess of precipitation, the ground was saturated and the streams already unusually high for the season, caused a rise to above flood stage at Portland, Oreg., on the 26th. Thereafter further rains and high water in the Columbia River increased the Portland stage until, on the 29th, the crest of 17.5 feet was reached at 3 p. m. The damage was slight, except at Kelso, Wash., where it is reported that, due to overflow from Coweman Creek, part of the city was under water for several days. Some damage was done also to highways, bridges, and railroads along small streams. In Portland the flood warnings, which were ample and well verified, permitted the removal of property from threatened basements and docks, so that the losses were practically negligible.

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ATLANTIC DRAINAGE					
Merrimac:	<i>Feet</i>			<i>Feet</i>	
Concord, N. H. -----	10			12.2	Nov. 5.
Manchester, N. H. -----	8			11.2	Do.
Connecticut:					
White River Junction, Vt.	15	4	8	35.0	Nov. 4.
Bellows Falls, Vt.	12	7	7	25.6	Do.
Holyoke, Mass.	9	4	8	14.8	Nov. 5.
Hartford, Conn.	16	4	10	29.0	Nov. 6.
Hudson:					
Troy, N. Y.	15	4	5	21.7	Nov. 4.
Albany, N. Y.	12	4	5	16.9	Nov. 5.
Susquehanna:					
Oneonta, N. Y.	12	4	5	13.2	Nov. 4.
Bainbridge, N. Y.	11	24	24	11.0	Nov. 24.
Unadilla: New Berlin, N. Y.	8			9.0	Nov. 18.
GREAT LAKES DRAINAGE					
St. Joseph: Montpelier, Ohio.	10			14.0	Nov. 30.

¹ Estimated.